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TOWNSEND AND TOWNSEND AND CREW, LLP
TWO EMBARCADERO CENTER
EIGHTH FLOOR
SAN FRANCISCO, CA 94111-3834

EXAMINER	
RENNER, CRAIG A	

ART UNIT	PAPER NUMBER
2627	

DATE MAILED: 11/27/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/665,917	KATAOKA, KOUJI	
	Examiner	Art Unit	
	Craig A. Renner	2627	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 September 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) *7-16* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6 and 17-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *11 September 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *16 June 2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Claims 7-16 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to one or more non-elected inventions/species, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 19 December 2005.

Drawings

2. The drawings were received on 11 September 2006. These drawings are accepted.

Specification

3. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed. The following is suggested:

--MAGNETORESISTIVE HEAD WITH ANTI-FERROMAGNETIC LAYER HAVING NON-MAGNETIC REGIONS ON BOTH ENDS.--

4. The disclosure is objected to because of the following informalities:

a. In line 1 of **amended** paragraph [0054], "conductive layer 21d" should be changed to --conductive layer 21a-- in order to be consistent with the remainder of the disclosure.

b. In line 2 of **amended** paragraph [0054], "conductive layer 21d" should be changed to --conductive layer 21b-- in order to be consistent with the remainder of the disclosure.

c. In line 9 of claim 19, "with" should be spelled --width--.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claim 20 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In line 2 of claim 20, "the non-magnetic region" is indefinite because it lacks clear and/or positive antecedent basis.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 1-6 and 17-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Han et al. (US 6,383,574).

With respect to claims 1-6 and 17-18, Han teaches a composite magnetic head comprising a magnetoresistive head (FIG. 4, for instance) comprising a lower magnetic shield (at least a portion of 10, see lines 4-23 in column 6, for instance, i.e., "shield layer") disposed above a substrate (includes at least another portion of 10, see lines 4-23 in column 6, for instance, i.e., "base substrate"); a lower gap layer (includes at least another portion of 10, see lines 4-23 in column 6, for instance, i.e., "non-magnetic spacer"); a first ferromagnetic layer (14); a non-magnetic layer (16); a second ferromagnetic layer (18); an anti-ferromagnetic layer (20) having implanted regions (20a and 20b) on both ends thereof; first electrode layers (22a and 22b) disposed respectively on the regions of the anti-ferromagnetic layer; magnetic domain control layers (28a and 28b) disposed respectively on the ends of a stack of layers consisting of the first ferromagnetic layer, the non-magnetic layer, the second ferromagnetic layer, the anti-ferromagnetic layer, and the first electrode layers (as shown in FIG. 4, for instance); and second electrode layers (30a and 30b) disposed above the magnetic domain control layers (as shown in FIG. 4, for instance), wherein a width between the regions of the anti-ferromagnetic layer is smaller than a track width of the first ferromagnetic layer (as shown in FIG. 4, for instance, i.e., the track width of the first ferromagnetic layer 14 includes portions 14a, 14c and 14b) [as per claims 1 and 5]; wherein the regions of both ends of the anti-ferromagnetic layer are formed by

implanting impurities into the anti-ferromagnetic material (lines 30-31 in column 8, for instance) [as per claim 2];, wherein a width of each of the first electrode layers is 20 nm or less (lines 48-50 in column 7, for instance) [as per claim 3]; wherein the first and the second electrode layers contain one or more of elements of at least Au, Ta, W, Ru, Rh, Cu, Ti, Ag, Pt, Pd, Cr, In, Ir, Nb and Zr (lines 39-48 in column 7 and line 65 in column 9 thru line 7 in column 10, for instance, i.e., both include Ta, for instance) [as per claim 4]; wherein crystal orientation underlying layers (22a and 22b) are disposed below the magnetic domain control layers (as shown in FIG. 4, for instance) [as per claim 6]; wherein the first ferromagnetic layer is provided between the lower gap layer and the non-magnetic layer (as shown in FIG. 4, for instance), and wherein the second ferromagnetic layer is provided between the anti- ferromagnetic layer and the non-magnetic layer (as shown in FIG. 4, for instance) [as per claim 17]; wherein the first ferromagnetic layer is a free layer (lines 35-36 in column 5, for instance), and wherein the second ferromagnetic layer is in contact with the anti-ferromagnetic layer (as shown in FIG. 4, for instance) [as per claim 18].

With respect to claims 19 and 20, Han teaches a magnetic head (FIG. 4, for instance) comprising a substrate (10); a free layer (14) provided above the substrate; a non-magnetic layer (16) provided above the free layer; a ferromagnetic layer (18) provided above the non-magnetic layer; and an anti-ferromagnetic layer (20) adjacent to the ferromagnetic layer, wherein the anti-ferromagnetic layer has an implanted portion (20a and 20b) and a magnetic portion (20c), wherein a width in a track width direction of the free layer is larger than a width in the track width direction of the magnetic portion

(as shown in FIG. 4, for instance, i.e., the width of the free layer 14 includes portions 14a, 14c and 14b) [as per claim 19]; wherein the magnetic head further comprises a pair of electrodes (22a and 22b) provided above the implanted portion of the anti-ferromagnetic layer (as shown in FIG. 4, for instance); magnetic domain control layers (28a and 28b) provided on ends of the free layer, the non-magnetic layer, the ferromagnetic layer, the anti-ferromagnetic layer, and the pair of electrodes (as shown in FIG. 4, for instance) [as per claim 20].

Han, however, does not explicitly state that the implanted portion/regions of the anti-ferromagnetic layer are "non-magnetic" as per claim 1-6 and 17-20; that the composite magnetic head further comprises "an upper gap layer disposed above the second electrode layers and the stack of layers; an upper magnetic shield disposed above the upper gap layer; and an inductive magnetic head disposed above the magnetoresistive head via an insulation layer" as per claims 1-6 and 17-18; and further that the composite magnetic head further comprises "soft magnetic layers ... disposed between the magnetic domain control layers and the second electrode layers" as per claim 5.

Han does however teach that pinned layer ion implanted regions (18a and 18b), which directly correspond to the ion implanted regions of the anti-ferromagnetic layer, are transformed into non-magnetic regions (lines 50-60 in column 8, for instance). Han also teaches application of the invention in a magnetic read/write head (lines 30-36 in column 1, for instance). Official notice is taken of the fact that is notoriously old and well known in the art to have a composite magnetic head further comprise an upper gap

layer disposed above electrode layers and a stack of layers and an upper magnetic shield disposed above the upper gap layer in the same field of endeavor for the purpose of protecting the head from stray flux. Official notice is also taken of the fact that it is notoriously old and well known in the art to have a composite magnetic head further comprise an inductive magnetic head disposed above a magnetoresistive head via an insulation layer in the same field of endeavor for the purpose of enabling information storage. Official notice is lastly taken of the fact that it is notoriously old and well known in the art to have a composite magnetic head further comprise soft magnetic layers disposed between magnetic domain control layers and electrode layers in the same field of endeavor for the purpose of increasing stability. It would have been obvious to a person having ordinary skill in the art at the time the invention was made to have had the implanted portion/regions of the anti-ferromagnetic layer of Han be non-magnetic; to have had the composite magnetic head of Han further comprise an upper gap layer disposed above the second electrode layers and the stack of layers; and an upper magnetic shield disposed above the upper gap layer; to have had the composite magnetic head of Han further comprise an inductive magnetic head disposed above the magnetoresistive head via an insulation layer; and to have had the composite magnetic head of Han further comprise soft magnetic layers disposed between the magnetic domain control layers and the second electrode layers. The rationale is as follows:

One of ordinary skill in the art would have been motivated to have had the implanted portion/regions of the anti-ferromagnetic layer of Han be non-magnetic since a person of ordinary skill in the art would have realized that there is no need to maintain

magnetism in the ion implanted regions of the anti-ferromagnetic layer since the pinned layer ion implanted regions, which directly correspond to the ion implanted regions of the anti-ferromagnetic layer, are transformed into non-magnetic regions, i.e., those regions of the pinned layer no longer require pinning by the anti-ferromagnetic layer.

One of ordinary skill in the art would have been motivated to have had the composite magnetic head of Han further comprise an upper gap layer disposed above the second electrode layers and the stack of layers; and an upper magnetic shield disposed above the upper gap layer since such protects the head from stray flux.

One of ordinary skill in the art would have been motivated to have had the composite magnetic head of Han further comprise an inductive magnetic head disposed above the magnetoresistive head via an insulation layer since such enables information storage, and since Han teaches application of the invention in a magnetic read/write head.

One of ordinary skill in the art would have been motivated to have had the composite magnetic head of Han further comprise soft magnetic layers disposed between the magnetic domain control layers and the second electrode layers since such increases stability.

Response to Arguments

9. Applicant's arguments filed 11 September 2006 have been fully considered but they are not persuasive.

The applicant argues that "Han et al. does not disclose or suggest an anti-ferromagnetic layer having non-magnetic regions on both ends thereof, wherein a width between the non-magnetic regions of the anti-ferromagnetic layer is smaller than a track width of the first ferromagnetic layer." This argument, however, is not found to be persuasive because of the following:

Han does teach an anti-ferromagnetic layer (20) having implanted regions (20a and 20b) on both ends thereof (as shown in FIG. 4, for instance), wherein a width between the implanted regions of the anti-ferromagnetic layer is smaller than a track width of a first ferromagnetic layer (14, as shown in FIG. 4, for instance). Just as applicant's antiferromagnetic layer can include non-magnetic regions, Han's first ferromagnetic layer can include non-magnetic regions, i.e., the non-magnetic regions do not necessarily shorten the layer in each aspect. One of ordinary skill in the art would have been motivated to have had the implanted regions of the anti-ferromagnetic layer of Han be non-magnetic since a person of ordinary skill in the art would have realized that there is no need to maintain magnetism in the ion implanted regions of the anti-ferromagnetic layer since the pinned layer ion implanted regions, which directly correspond to the ion implanted regions of the anti-ferromagnetic layer, are transformed into non-magnetic regions, i.e., those regions of the pinned layer no longer require pinning by the anti-ferromagnetic layer.

Conclusion

10. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Craig A. Renner whose telephone number is (571) 272-7580. The examiner can normally be reached on Monday-Tuesday & Thursday-Friday 9:00 AM - 7:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hoa T. Nguyen can be reached on (571) 272-7579. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Craig A. Renner
Primary Examiner
Art Unit 2627

CAR